14.23

CONTROLLING THE SALINITY OF THE SALTON SEA

BY TRANSFERRING WATER TO THE GULF OF CALIFORNIA

BUREAU OF RECLAMATION
LOWER COLORADO REGION
DIVISION OF PLANNING AND LOANS

OCTOBER 1991

TECHNICAL INFORMATION BY

TOM RAWLINS

NARRATIVE DESCRIPTION BY

MARY ELAINE RADEL
AND
WILLIAM MCKAY

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CONTROLLING THE SALINITY OF THE SALTON SEA

Information in this report was developed at a sub-reconnaissance level. Since the purpose of this effort was only to develop a general concept of the possibility of exchanging water between the Salton Sea and the Gulf of California, design numbers and cost figures should be viewed only as approximate and subject to change during any future more detailed analysis. Presentation of design and cost estimates for individual features should NOT be construed to mean that a precise analysis of those features was done. Rather, these designs and costs may be used to convey a general idea of the magnitude of costs for a water exchange project.

This report describes two options (4 alternatives) for controlling the salinity of the Salton Sea by providing a surrogate outlet to the Gulf of California. Technical data for this report was developed by the Engineering division of the Bureau of Reclamation in Denver, Colorado. Information was developed at a sub-reconnaissance level.

Two options for controlling salinity in the Salton Sea are presented in this report. The first option would stabilize salinity at about 35,000 mg/l, but would not allow control of water surface elevation. The second option would stabilize salinity at about 35,000 mg/l, and allow control of the water surface elevation.

The first option concentrates on pumping 100,000 acre-feet a year away from the Salton Sea and discharging the water at Laguna Salada in Northern Mexico. No water would be transported from the Gulf of California to the Salton Sea.

The second option deals with pumping 415,000 acre feet of water annually from the Salton Sea and discharging it into Laguna Salada. Then 400,000 acre-feet of the less salty ocean water will be pumped annually from the Gulf of California into the Salton Sea.

Both options were examined using a canal/pipeline alternative and an all pipeline alternative. The total cost of each option was obtained by adding 25% for contingencies and 30% for indirects to the total construction costs.

Option 1
Alternative 1

- **100,000 Acre-Feet/Year Piped from the Salton Sea to Laguna Salada**
- **Combination Canal and Pipeline**

This alternative will use an intake channel, a canal, four sections of pipeline, and three pumping plants. The total length of this option (canal, pipeline, and intake channel) is 56 miles. The canal section is 44.5 miles long, the pipeline section is 11 miles long, and the intake channel is .5 of a mile long.

The intake channel would have a water depth of 7 feet, a bottom width of 18.4 feet, and 3:1 side slopes. It will cost $300,000.

The canal section would have a water depth of 5 feet. a bottom width of 6 feet, and a side slope of 1 1/2:1. The cost for the canal is $27,500,000.

Four sections of pipeline are needed. The first three sections use a 72" diameter pipe size. The outfall pipeline will use a 42" diameter pipe size.

The first section of pipeline carries water from the Salton Sea Pumping Plant to the canal. The distance of this section of pipeline is 25,000 feet. The cost is $8,100,000. The second section of pipeline is needed to carry water under the highway US 8 for 12,000 feet. The cost is $3,500,000. The third section of pipeline will carry water as it leaves La Rosita Pumping Plant 12,000 feet to the saddle of Laguna Salada. The cost is $3,900,000. The outfall pipeline is needed to carry water 11,000 feet from the saddle of Laguna Salada to Laguna Salada at a cost of $1,400,000.

This plan needs three pumping plants. The first plant needed is the Salton Sea Pumping Plant, which is located on the southern tip of the Salton Sea. This is a 3947 Kw plant that will cost $5,600,000. The second plant needed is the Canal Pumping Plant, located 2 miles south of the southern tip of the Naval Reservation. This is a 987 Kw plant that will cost $2,800,000. The third plant needed is La Rosita Pumping Plant. It is located near the town of La Rosita in Mexico. It is a 3067 Kw plant that will cost $4,900,000. The total cost of the pumping plants is $13,000,000.

TOTAL COST: $95,000,000

Option 1
Alternative 2

- **100,000 Acre-Feet/Year Transported from the Salton Sea to Laguna Salada**
- **Pipeline Only**

This alternative will use an intake channel, four sections of pipeline and two pumping plants. The total length of this option is 45 miles.

The intake channel would have a water depth of 7 feet, a bottom width of 6 feet, and a side slope of 1 1/2:1. It will cost $300,000.

Four sections of pipeline are used. The first three sections use a 72" diameter pipe size. The outfall pipeline will use a 42" diameter pipe size.

The first section of pipeline carries water from the Salton Sea Pumping Plant to a water storage tank. The distance of this section is 31,000 feet and the cost is $13,400,000. The second section of pipeline goes from the water storage tank to La Rosita Pumping Plant. The distance is 182,000 feet at a cost of $61,700,000. The third section of pipeline will carry water from La Rosita Pumping Plant 12,000 feet to the Saddle of Laguna Salada. The cost is $3,900,000. The outfall pipeline is needed to carry water a distance of 11,000 feet from the saddle of Laguna Salada to Laguna Salada at a cost of $1,400,000.

This plan needs two pumping plants. The first plant is the Salton Sea Pumping Plant which is located on the Southern tip of the Salton Sea. This is a 6,510 Kw plant and it will cost $7,700,000. The second pumping plant is the 4,120 Kw La Rosita Pumping Plant which will cost $4,900,000. The total cost of the pumping plants is $12,600,000.

TOTAL COST: $153,000,000

Option 2
Alternative 1

- **415,000 Acre-Feet a Year from the Salton Sea to Laguna Salada**
- **400,000 Acre-Feet a Year from the Gulf of California to the Salton Sea**
- **Combination Canal and Pipeline**

The plan to transport 415,000 acre-feet a year from the Salton Sea to Laguna Salada:

This part of the alternative will use an intake channel, a canal, four sections of pipeline, and three pumping plants. The total length of this option (canal, pipeline, and intake channel) is 56 miles. The canal section is 44.5 miles long, the pipeline section is 11 miles long, and the intake channel is .5 of a mile long.

The intake channel will have a water depth of 12 feet, a bottom width of 60 feet, and a side slope of 3:1. The cost will be $3,000,000.

The canal would have a water depth of 8.5 feet and a bottom width of 10 feet. The canal will cost $54,500,000.

Five sections of pipeline are needed. The first four sections use 2-96" diameter pipes. The outfall pipeline uses an 84" diameter pipe.

The first section of pipeline carries water from the Salton Sea Pumping Plant to the canal. The distance of this section of pipeline is 25,000 feet. The cost is $28,200,000. The second section of pipeline is needed to carry water around the southern tip of the Naval Reservation for 12,000 feet. It will cost $13,000,000. The third section of pipeline will carry water as it leaves La Rosita Pumping Plant 12,000 feet to the saddle of Laguna Salada. The cost is $12,500,000. The outfall pipeline/channel is needed to carry water from the saddle of Laguna Salada to Laguna Salada. For this, an 84" diameter pipe would be used for 8,000 feet until we got to sea level. Then a channel would be constructed (with the same dimensions of the intake channel but with 1:1 side slopes) that is 3,000 feet long. The cost for this section will be $6,400,000.

This plan needs three pumping plants. The first pumping plant that is needed is the Salton Sea Pumping Plant. It will be located on the southern tip of the Salton Sea. This is a 16,400 Kw plant and will cost $20,000,000. The second plant we need is the Canal Pumping Plant which is located 2 miles south of the southern tip of the Naval Reservation. It is a 4,100 Kw plant, and it will cost $10,100,000. The third plant is the La Rosita Pumping Plant which is located one mile south of the town of La Rosita in Mexico. It is a 13,000 Kw plant and it will cost $17,400,000. The total cost of the pumping plants is $47,500,000 and the annual energy use is 257,000,000 Kwhr/yr.

SUB COST: $270,000,000

The plan to transport 400,000 acre-feet a year from the Gulf of California to the Salton Sea:

This part of the alternative will use an intake channel, a canal, a pipeline, a siphon, an outlet channel, a small power plant, and one pumping plant. The total length of this option is 583,000 feet or 110 miles long.

The intake pipeline and the pumping plant would be located at Las Amajas, Mexico.

The canal would have a water depth of 8.5 feet, and a bottom width of 10 feet. The canal will cost $87,500,000.

The pipeline would be from the Gulf of Mexico to Cerro Prieto is 185,000 feet or 35 miles long. The cost of this pipeline is $220,000,000.

One pumping plant will be needed at the Gulf. The pumping plant will cost $21,000,000.

An 11,000 foot long double inverted siphon will carry water around the southern tip of the Naval Reservation,. Each siphon is sized at 78" in diameter. Siphon cost is $7,500,000.

The outlet channel at the Salton Sea has 3:1 side slopes, a depth of 12 feet, and width of 60 feet. The cost for this outlet channel is $2,900,000.

Preliminary studies show that an energy recovery program for the 30,000 foot line to the Salton Sea would be beneficial and economical. The power plant would be sized at 6000 Kw and generate 53,000,000 Kwhr/yr. The power plant will use the energy it generates partially to offset pumping requirements. The power plant will cost $11,000,000.

SUB COST: $605,000,000

The total cost of Option #2, Alternative #1, using a canal and pipeline combination that transports 415,000 thousand feet of water from the Salton Sea to Laguna Salada and 400,000 acre feet of water from the Gulf of California to the Salton Sea is:

TOTAL COST: $775,000,000

Option 2
Alternative 2

- **415,000 Acre-Feet/Year from the Salton Sea to Laguna Salada**
- **400,000 Acre-Feet/Year from the Gulf of California to the Salton Sea**
- **Pipeline Only**

The plan to transport 415,000 acre-feet a year from the Salton Sea to Laguna Salada:

This part of the alternative will use an intake channel, four sections of pipeline and two pumping plants. The total length of this option is 236,000 feet or 44.5 miles long.

The intake channel will have a water depth of 12 feet, a bottom width of 60 feet, and a side slope of 3:1. The cost will be $3,000,000.

Four sections of pipeline are used. The first three sections use 2-96" pipes in the same trench. The outfall pipeline will use an 84" diameter pipe.

The first section of pipeline carries water 31,000 feet from the Salton Sea Pumping Plant to a water storage tank. The cost is $43,000,000. The second section of pipeline goes from the water storage tank to La Rosita Pumping Plant. The distance is 182,000 feet at a cost of $171,000,000. The third section of pipeline will carry water from La Rosita Pumping Plant 12,000 feet to the Saddle of Laguna Salada. The cost is $12,500,000. The outfall pipeline is needed to carry water from the saddle of Laguna Salada to Laguna Salada. Here, an 84" diameter pipe will be used for 8,000 feet until it got to sea level. Then a channel would be constructed (with the same dimensions of the intake channel but with side slopes 1:1) that is 3,000 feet long. The cost for this section will be $6,400,000.

Two pumping plants will need to be constructed. The Salton Sea Pumping Plant which will cost $27,000,000, and the La Rosita Pumping Plant which will cost $17,400,000. The annual energy use is 302,000,000 Kwhr/yr.

SUB COST: $532,000,000

The plan to transport 400,000 acre-feet a year from the Gulf of California to the Salton Sea:

The total length of this part of the alternative is 583,000 feet or 110 miles long. Three pipeline sections, using two pipes in the same trench, and one pumping plant are needed.

The first pipeline is the intake into the Las Amajas Pumping Plant. 2-96" pipes would be used for this. The second pipeline is 35 miles long and goes from the pumping plant at the Gulf of California to EL 82, which is near town of Cerro Prieto. The pipes are sized at 96" in diameter, and the cost of the second pipeline is $220,000,000. The next section of pipeline runs between EL 82 and the Salton Sea. Two different size pipes are needed. For 266,000 feet to EL -20, we need to use a 108" diameter pipe size, then we will use a 78" diameter pipe down to the Salton Sea. This sections of pipeline will cost $343,000,000.

The outlet channel at the Salton Sea has 3:1 side slopes, a depth of 12 feet, and width of 60 feet. The cost for this outlet channel is $2,900,000.

The 18,000 Kw Las Amajas pumping plant will cost $21,000,000.

There is not an opportunity for energy recovery. Results have shown that the additional cost of the larger size pipes is not worth the additional energy savings. An energy dissipation structure will be needed however. The cost for the structure is $2,000,000.

SUB COST: $964,000,000

The total cost of Option #2, Alternative #2, using an all pipeline alternative that pipes 415,000 thousand feet of water from the Salton Sea to Laguna Salada and 400,000 acre feet of water from the Gulf of California to the Salton Sea is

TOTAL COST: $1496,000,000

14-24

1043

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
1414 8th St., Box 723
Riverside, California
92502

IN REPLY REFER TO:
LA 039076 (2.0)
2226 (LOL)

OCT 23 1963

Jesse L. Andrews
Post Office Box 777
Hemet, California

Dear Mr. Andrews:

You may be able to acquire title to the land in your above referenced desert land entry under the Relief Act of February 14, 1934 (48 Stat 349; 43 U.S.C. 339). The regulations under which such an application is properly filed are found at 43 CFR 232.57-.58. (See Circular 1991, enclosed).

There is no form provided for making an application for relief. It may be made in letter form but must include all of the information required by 43 CFR 232.40 as well as the above quoted regulations (See 43 CFR 232.57(a)). The application must be accompanied by a $10.00 service fee which is not returnable.

Please note that an applicant under the provisions of the above relief act must show that there is no reasonable prospect that water will become available in sufficient quantity to effect reclamation of the irrigable land or any legal subdivision thereof. A legal subdivision is defined as a quarter-quarter section. A statement to this effect from the responsible officials of the Imperial Irrigation District will be helpful to us in making a determination.

Sincerely yours,

Keith M. Corrigall
Assistant Land Office Manager

Enclosure

14-25

FILE 16-11 36-05
FOLDER NO. 14
7/20/4
100.3

November 1, 1963

Shatford and Shatford
Attorneys at Law
5920 North Temple City Boulevard
Temple City, California

C O P Y

Attention: Mr. Walter T. Shatford II

Subject: The Estate of Alice V. Finch, deceased

Gentlemen:

Receipt is acknowledged of your letter of October 25, 1963, which makes reference to my letter of April 17, 1963, regarding the N. W. 1/4 of Section 14, T. 16 S., R. 11 E., S. B. B. and M., County of Imperial, State of California, as pertains to Desert Land Entry filed March 10, 1911, in the name of Frank Stewart, husband of Alice V. Finch, deceased.

With reference to the United States Supreme Court action sustaining Arizona and its effect on the land, I wish to advise that the decision in this case does not change the District's position as concerns the delivery of water to the lands as reported in the third paragraph of my letter of April 17, which stated as follows:

> "Water could be made available from the Westside Main Canal, a distance of approximately 3-1/2 miles, with entryman accepting Westside Main Canal as a point of delivery and bearing all costs of the development which would include, in addition to preparation of the land itself, the delivery gate at the canal, the pump or pumps necessary, the concrete ditch necessary to transport the water from the District canal to the land, and the rights of way for same."

It is my opinion that the decision does perhaps make it less likely that we as a District will be able to treat the East and West Mesa lands as lands lying within the Imperial Unit and entitled to water pursuant to the "Rules and Regulations Governing the Distribution and Use of Water and Construction, Operation and Maintenance of the Canal and Drainage System."

The fact that the District did include the above-mentioned parcel of land in the West Kern Unit entitles it to water, providing the entryman accepts the Westside Main Canal as a diversion point. I realize fully that this is not economically feasible; however, under the terms of our All-American Canal Contract, we must take the position that water can be made available on this basis.

We trust the above gives you the information you desire.

Yours very truly

R. F. CARTER
General Manager

RFC:mef
cc Mr. Thompson
Mr. Fudge
Mr. Kennedy

COPY

14-26

100 E

C E R T I F I C A T E

BUREAU OF LAND MANAGEMENT
LOS ANGELES, CALIFORNIA

Applicant Boyle E. Wilson

THIS IS TO CERTIFY that the following described property is located within the service area as defined in the All-American Canal Contract of December 1, 1932:

The S. E. 1/4 of Section 30, T. 16 S., R. 12 E., S. B. M. and M.

THAT Imperial Irrigation District is an irrigation district organized and existing under the laws of the State of California;

THAT Imperial Irrigation District is actually engaged in the distribution of water to lands within its boundaries; and water for irrigation and reclamation of the above-described lands will be furnished and delivered when said land is in condition to receive the same. That delivery of water shall at all times be subject to the rules and regulations of Imperial Irrigation District and the provisions of Division 11 of the Water Code of the State of California, as the same now or hereafter shall exist;

THAT the conditions hereinafter set forth must be complied with prior to delivery of water to said lands.

1. Entryman will make application for inclusion of lands within boundaries of Imperial Irrigation District;

2. Entryman will bear all expense of necessary irrigation and drainage facilities, including pumps and pump units if required;

3. Entryman shall furnish all facilities necessary to provide ingress and egress to and from said lands; and

4. Entryman will grant District right of way for contour main canal.

(S E A L)

IMPERIAL IRRIGATION DISTRICT

By_____
Secretary

14-27

100.3 [illegible]

[illegible]

[illegible] Irrigation [illegible]
[illegible]

[illegible],

I [illegible] (E½NE¼, S½NE¼, NE¼SE¼ [illegible] Sec 27 T11S R28E) [illegible] accompanying the deed? Will you please give me [illegible] responsible for this tract which straddles the [illegible] Canal [illegible]?

The tract was originally deeded [illegible] many years ago. The Bureau has been out of contact with anybody [illegible] saying that [illegible] finally [illegible] the [illegible] that they [illegible] any [illegible] by [illegible] responsibility.

Of course I understand that [illegible] the [illegible] information [illegible]

[illegible]

[illegible]

[illegible] Information
[illegible]
[illegible]
[illegible] ✓
General File

C E R T I F I C A T E

BUREAU OF LAND MANAGEMENT
LOS ANGELES, CALIFORNIA

Applicant Edgar L. Bateman

THIS IS TO CERTIFY that the following described property is located within the service area as defined in the All-American Canal Contract of December 1, 1932:

The E. 1/2 of the E. W. 1/4; the E. E. 1/4 of the W. E. 1/4 and the E. E. 1/4 of the S. W. 1/4 of Section 33, T. 16 S., R. 12 E., S. B. B. and M.

THAT Imperial Irrigation District is an irrigation district organized and existing under the laws of the State of California;

THAT Imperial Irrigation District is actually engaged in the distribution of water to lands within its boundaries; and water for irrigation and reclamation of the above-described lands will be furnished and delivered when said land is in condition to receive the same. That delivery of water shall at all times be subject to the rules and regulations of Imperial Irrigation District and the provisions of Division 11 of the Water Code of the State of California, as the same now or hereafter shall exist;

THAT the conditions hereinafter set forth must be complied with prior to delivery of water to said lands.

1. Bateman will make application for inclusion of lands within boundaries of Imperial Irrigation District;
2. Bateman will bear all expense of necessary irrigation and drainage facilities, including pumps and pump sumps if required;
3. Bateman shall furnish all facilities necessary to provide ingress and egress to and from said lands; and
4. Bateman will grant District right of way for lateral Main Canal.

S E A L)

IMPERIAL IRRIGATION DISTRICT

By _____
Secretary

Authorized by Board of Directors at its meeting of _____

14-28

16-19
FILING NO. Sec 36
100.3

April 11, 1963

COPY

Mr. A. B. West, Regional Director
U. S. Bureau of Reclamation
Region 3
Boulder City, Nevada

Attention: 3-420

Dear Mr. West:

This will acknowledge receipt of your letter of April 4, 1963, regarding inquiry received by you from F. E. Sessions concerning delivery of water to Section 36, T. 14 S., R. 19 E., S. B. B. & M.

Imperial Irrigation District has no objection to the transfer of the license you refer to and issued to Robert E. Fowler, now deceased, to accommodate the request made by F. E. Sessions; providing, however, that all facilities for the conveyance of water from the District's delivery gate to the farm head ditch or ditches, said farm head ditch or ditches and any tail ditches for collecting unused water for use on other portions of the land being irrigated shall be pipe or lined open ditch. It shall be understood that all water delivered shall be in accordance with Imperial Irrigation District's "Rules and Regulations Governing the Distribution and Use of Water and Construction, Operation and Maintenance of the Canal and Drainage System."

Yours very truly

R. F. CARTER
General Manager

RFC:ml
cc Mr. Thompson
Mr. Paige
Mr. Bonnett
Mr. McClendon

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
REGION 3
BOULDER CITY, NEVADA

IN REPLY
REFER TO: 3-420

April 4, 1963

Mr. R. F. Carter
General Manager
Imperial Irrigation District
582 State Street
El Centro, California

Dear Mr. Carter:

Mr. Robert B. Bowler, now deceased, requested and received, during March 1958, a license for construction, operation, and maintenance of an open irrigation lateral to convey water across Reclamation-withdrawn land to serve privately owned land in the vicinity of Drop No. 1, All-American Canal System. The term of the license was for 25 years, and a provision thereof was that the lateral would be lined in accordance with Imperial Irrigation District Regulation No. 19 concerning delivery of water to mesa lands.

Recently, we have received an inquiry from Mr. F. R. Sessions, 4871 Saratoga Avenue, San Diego 7, California, asking whether he may obtain an assignment of the above-mentioned license so that he can irrigate his land in Section 36, T. 16 S., R. 19 E., SBM. We would appreciate receiving your comments concerning the availability of water from the system to serve Mr. Sessions' land, if an assignment of the above-mentioned license is made.

Sincerely yours,

Acting for
A. B. West
Regional Director

Verifax copies:
Thompson
Carter
Roussel
Fudge
McGlocklin

14-29

100.3

September 8, 1955

COPY

Department of the Interior
Bureau of Land Management
Land Office
Post Office Building
Los Angeles, California

Gentlemen:

The following have filed Petitions for Inclusion within Imperial Irrigation District. Will you please advise as to the status of the entries.

SE¼ of NE¼ Section 1, T 14 S, R 12 E, S.B.M., Eugene Richardson.

E½ of SE¼ of Section 18, T 17 S, R 13 E, S.B.M., George Brandt.

W½ of SE¼ of Section 12 and NE¼ and NE¼ of SE¼ of Section 13, T 17 S, R. 12 E, S.B.M., Bertha E. Wixom.

SE¼ of Section 19, T 16 S, R 12 E, S.B.M. Harley G. and Otis D. Ball, heirs of Mary B. Bosworth.

Yours very truly,

G. L. DERMODY
Assistant Secretary

GLD:ds
Copies to:
Hewes
Weiss
General Files
Copy made for:
Mr. Welch
Mr. Hartzog
M&F Section

14-30

102.3

CERTIFICATE

BUREAU OF LAND MANAGEMENT
LOS ANGELES, CALIFORNIA

Applicant George F. Brandt

THIS IS TO CERTIFY that the following described property is located within the service area as defined in the All-American Canal Contract of December 1, 1932:

The W. 1/2 of the S. W. 1/4 and the S. E. 1/4 of the S. W. 1/4 of Section 17; the E. 1/2 of the S. E. 1/4 of Section 18; and the N. 1/2 of the N. W. 1/4 and the S. E. 1/4 of the N. W. 1/4 of Section 20, all in T. 17 S., R. 13 E., S. B. B. and M., County of Imperial, State of California.

THAT Imperial Irrigation District is an irrigation district organized and existing under the laws of the State of California;

THAT Imperial Irrigation District is actually engaged in the distribution of water to lands within its boundaries; and water for irrigation and reclamation on the above-described lands will be furnished and delivered when said land is in condition to receive the same. That delivery of water shall at all times be subject to the rules and regulations of Imperial Irrigation District and the provisions of Division 11 of the Water Code of the State of California, as the same now or hereafter shall exist;

THAT the conditions hereinafter set forth must be complied with prior to delivery of water to said lands;

1. Entryman will bear all expense of necessary irrigation and drainage facilities, including pumps and pump sumps if required;

2. Entryman shall furnish all facilities necessary to provide ingress and egress to and from said lands; and

3. Entryman will grant District right of way for Westside Main Canal.

IMPERIAL IRRIGATION DISTRICT

By Burton H. Bidwell (Signed)
Secretary

14-31

DRAINWATER QUALITY IMPROVEMENT PROGRAM
(DWQIP) by Jones & Stokes Associates,
500.01

MAY-11-'94 14:49 ID:JONES-STOKES

Jones & Stokes Associates, Inc.

2600 V Street, Suite 100 • Sacramento, CA 95818-1914 • Fax 916/737-3030 • 916/737-3000

☐ Mail ☒ Fax ☐ Overnight ☐ Courier

To: Steve Knell

(619) 339-9262

Date:

Client:

Project:

Project #:

Subject:

☐ Enclosure(s) ☐ Per your request ☐ For your review ☐ For your information/use

☐ Other

____ Total pages faxed Original will follow by mail ☐ yes ☐ no

Quantity	Description
1	Copy of Drain Water Quality Improvement Plan

Message:

May 11, 1994

Mr. Steve Knell
General Superintendent, Drainage
333 East Barioni Boulevard
Imperial, CA 92251

Dear Mr. Knell:

At your request, Jones & Stokes Associates has prepared a scope of work to prepare a Drain Water Quality Improvement Program (DWQIP) for Imperial Irrigation District (IID). We prepared our scope to address the issues and water quality sampling requirements mentioned in the letter from Phil Gruenberg of the Regional Water Quality Control Board (RWQCB).

The scope of work includes costs for Jones & Stokes Associates to collect the water quality samples and deliver the samples to the lab. This task could also be performed by IID and we can discuss this issue during our initial project coordination meeting. Any additional refinements of scope or cost could also be discussed during initial consultation.

We are excited to assist IID on this project and believe it dovetails with the water quality analysis we are conducting for the stormwater drainage master plan. Jones & Stokes Associates' extensive experience working with regulatory agencies will benefit IID in negotiating the scope of water quality monitoring. Issues that should be discussed initially and then revisited in 6 months and 12 months include the constituents sampled, sampling frequency, and the detection level.

We understand the role of the DWQIP as a water quality management tool to assist IID in compliance with RWQCB requirements. The scope of work for the DWQIP also describes the roles of agency coordination, the BMP program, and public outreach in developing a workable program. We believe the DWQIP process can best be developed in three phases as described below.

- Phase I. Develop the draft DWQIP and establish baseline monitoring for 1 year.
- Phase II. Develop the final DWQIP and incorporate results of first-year monitoring, pilot-test the recommended best management practices (BMPs).
- Phase III. IID conducts long-term water quality monitoring and implements workable BMPs determined in Phase II.

The three-phase approach allows adjustments of the DWQIP for monitoring results after Phase I and the results of pilot testing after Phase II. Jones & Stokes Associates would have a decreasing role through the phases, with Phase III being conducted primarily by IID with consultation by Jones & Stokes Associates.

We have developed costs for the Phase I DWQIP, including water quality monitoring. The anticipated cost for the laboratory testing of water quality samples in Phase I is $133,000. The estimated cost for Jones & Stokes Associates to prepare the draft DWQIP and collect the water quality samples is $257,768. If IID collects the water quality samples, the total DWQIP and laboratory costs would be $207,196. We will discuss these costs with IID during the initial consultation.

Thank you for the opportunity to develop a scope to prepare the DWQIP. We look forward to working with IID on this important project. Please contact Paul Wisheropp, P.E., if you have any questions.

Sincerely,

Curtis E. Spencer, P.E.
President

CES:rbm
Enclosure

Scope of Work
to Prepare a
Drain Water Quality Improvement Plan

Prepared for:

Imperial Irrigation District
333 East Barioni Boulevard
Imperial, CA 92251
Contact: Steve Knell, P.E.

Prepared By:

Jones & Stokes Associates
2600 V Street
Sacramento, CA 95818
Contact: Paul Wisheropp, P.E.
916/737-3000

May 11, 1994

Scope of Work to Prepare the Imperial Irrigation District Drain Water Quality Improvement Program

INTRODUCTION

This scope of work is intended to assist Imperial Irrigation District (IID) with developing and implementing a drain water quality improvement program (DWQIP). The elements of the scope of work respond to issues raised in the April 6, 1994 letter from Phil Gruenberg of the Colorado Region, Regional Water Quality Control Board (RWQCB) to IID.

APPROACH AND PURPOSE

The purpose of this scope of work is to develop a DWQIP that is based on real data and therefore provide a solid foundation for the principles and ideas identified in the program. Water quality monitoring and improvement is expensive and therefore efforts to monitor and improve water quality must be reasonable, efficient, and achieve the goals of the program. To make a successful transition from conceptual to workable solutions for water quality control, the foundation of the program must be based on real-time water quality monitoring data and testing of best management practices (BMPs).

Developing the DWQIP will entail data collection and analysis, development and testing of BMPs, and creation of a final program.

Jones & Stokes Associates proposes to develop the DWQIP in the following three phases:

- develop the preliminary BMP program while collecting first-year baseline data and identifying conceptual BMPs,
- use the data to finalize the program and test BMPs, and
- conduct long-term monitoring to verify the program.

This three-phase approach acknowledges the importance of real-time data in shaping the conceptual DQWIP ideas into an implementable plan.

Because Phases II and III depend on the results of Phase I, they are only described generally in this scope of work. The detailed scope and costs will be developed at the end of each phase.

PHASE I TASKS

Phase I is intended to initiate data collection and program development. Three tasks in this phase will lay the groundwork for the program and will begin addressing the issues identified in the RWQCB letter.

Coordination

Development of the program will require continuous coordination between Jones & Stokes Associates, IID, the RWQCB, and other agencies. This coordination will occur as progress meetings, clarification of scope, data requests, and decisions on products. Communication with IID and the RWQCB is described below.

Imperial Irrigation District

We will meet with IID at the start of the project to refine the scope of work and budget and initiate the project. Because of the complexity of the DWQIP, the final scope will be refined from what is proposed herein. The availability of IID personnel to assist on project tasks such as water quality monitoring will be discussed in this task. We will also meet with IID quarterly to discuss the project progress and update IID on new information.

IID has access to data concerning the drainage system, history of water quality problems, agricultural practices, and measured data. These data and other information will be needed to develop the DWQIP. We will communicate directly with IID to find data and incorporate these data into the program. IID also is a direct link to the farmers for issues such as reserving land for BMP testing.

Regional Board

The RWQCB has extensive water quality monitoring data that will assist in describing background conditions, trends, and priority pollutants. We will communicate with RWQCB staff to obtain these data.

We anticipate that RWQCB will clarify its direction, as originally identified in the April 6 letter, throughout the DWQIP process. This will require coordination with RWQCB staff to avoid including program elements that would contradict RWQCB requirements.

BMP Program

The RWQCB letter requests IID to develop and implement BMPs to control pollutants that enter the drains. The Phase I BMP program will develop a list of available BMPs that would apply to land use practices within the IID service area that contribute pollutants to the drains. The list of BMPs will be developed from available data, including the San Joaquin Valley drainage program.

Evaluate Information and Recommend BMPs

We will develop the conceptual BMPs and reference examples of their previous use, effectiveness, cost, and applicability for large-scale use. We will identify BMPs used throughout California, with emphasis on BMPs applicable to the IID service area, and their estimated effectiveness. The fig drain and peach drain projects are examples of BMPs we will evaluate using collected data, field assessment, and information from discussions with IID personnel.

For Phase I, the BMP list is conceptual and is designed to present all reasonable BMPs. Detailed evaluation of the BMPs through pilot testing is included in Phase II.

Recommend BMP Testing Program

The BMP Program will include recommended testing of BMPs developed and summarized on the list. The testing will entail small-scale pilot testing for a 1-year period to occur in Phase II.

In Phase I we will develop a preliminary testing program and budget. We will develop the final testing program and the expected costs in consultation with IID for the testing in Phase II. The actual testing will occur in Phase II, described below. We anticipate the testing will involve land owned by IID and private landowners.

Public Outreach

Long-term implementation of BMPs will entail cooperation with the farmers and other landowners. Cooperation will be obtained only after the process of water quality improvement, the DWQIP, and the purpose of BMPs are explained.

The public outreach will begin in Phase I and conclude in Phase III. The initial effort will involve preparing public information material to involve the farmers in the development of the DWQIP. We will then develop information to explain BMPs, including what they are, what they accomplish, and why they are needed. Finally, we will work with IID to identify cooperating farmers for the Phase II testing of the BMPs. The public education aspect of Phase I focuses on explaining BMPs and their purpose.

Water Quality Monitoring

Identify Water Quality Monitoring Objectives

The overall program objectives were stated in the RWQCB letter of April 6, 1994. To support the attainment of these objectives and ensure program success, more specific objectives for the water quality monitoring effort will be identified. Jones & Stokes Associates will refine the RWQCB objectives into specific objectives to guide the monitoring program. Identification of specific monitoring plan objectives will ensure that the level of monitoring is appropriate and effective, and that the data produced will lead to valid conclusions.

Refine Water Quality Monitoring Plan

The scope of work for the water quality monitoring plan was presented in substantial detail in the referenced RWQCB letter. However, recent conversations with RWQCB and IID staff indicated that refinement and additional changes and/or modifications to the scope may be warranted. The following key areas will be considered in this task:

- evaluate the need for inflow monitoring; sufficient data may already be available for some of the constituents;
- four drains were identified in the RWQCB scope; verify adequacy of existing drains proposed for monitoring and evaluate the need to include additional drains to monitor according to the RWQCB letter;

- specific parameters to be monitored will be refined, especially for pesticide analyses; this will help reduce the high cost of these analyses and still achieve the monitoring program objectives;
- sample collection and analytical methods for sediment and biological monitoring, including selection of a second aquatic species for tissue monitoring;
- method detection limits will be evaluated for metals (e.g., boron, selenium) and pesticides; low detection limits will be specified in laboratory subcontract agreements where necessary to facilitate comparison with criteria or water quality objectives;
- input and coordination with RWQCB staff and meet with IID staff together; and
- reevaluate the sampling program and laboratory costs.

Scope of Work for Laboratory Analyses

The laboratory analyses to be included in the DWQIP were presented in the RWQCB letter. The scope of work for these analyses is presented in Table 1, "Phase I Water Quality Sampling Plan". Table 1 includes the sample type, location, and frequency of sampling specified in the RWQCB letter. Table 1 also includes the number of samples, the constituents to be analyzed for each type by groups, and the analytical cost for each sample type. Information for constituent groups and costs per group is based on Table 2, "Approximate Laboratory Analysis Costs by Constituent Group". Table 2 lists each constituent to be analyzed by group, the cost/sample for each constituent, and the cost/sample for each constituent group.

The methods specified for metals analyses in Table 2 are intended to obtain the lowest possible detection limits. Initial results may allow lower cost methods (higher detection limits) to be used if a metal is present in sufficiently high concentration. Pesticide analyses, as noted in (b) of Table 2, are priced at the method that is the lowest cost possible for these compound types; compound selection for each scan may change during the refinement task as noted above.

The total estimated cost for all laboratory costs specified for Phase I is $133,000. This substantial cost is due primarily to two factors, chronic toxicity testing and drain water pesticide analyses. Chronic toxicity testing is $2,600/sample for 16 samples, for a total of $41,600; drain water pesticide analyses include 72 samples at $825/sample, for a total of $59,400. These two components alone contribute a total of $101,000, or 76% of the total estimated laboratory cost. Laboratory costs likely will be less than this amount for the year because some metals and pesticides can be dropped from analysis if they are not found during initial sampling.

Table 1. Phase I Water Quality Sampling Plan

Sample Type	Location(s)	Frequency (times per year)	Number of Samples	Constituent Group Analyzed [c]	Analysis Cost/ Constituent Group (dollars) [d]
Inflow	All American Canal [a]	4	4	1 and 2	1,240 [e]
Drain water	Four drains, Two rivers	12	72	1, 2, and 4	81,720
Chronic Toxicity testing	Alamo River	12	12	5	41,600
	Inflow	4	4		
Sediment	Alamo River	4	4	2, 3, and 4	4,200 [f]
Biological [b]	Alamo River	4	4	2, 3, and 4	4,220 [f]
Total estimated laboratory costs					133,000

Total number of samples/type:

Water quality	76
Chronic toxicity testing	16
Sediment	4
Biological	4

[a] Or other representative location.
[b] Includes fish and one other aquatic species.
[c] Constituent groups are shown in Table 2.
[d] Number of samples times cost/sample for each group (Table 2).
[e] Includes daily equipment fee at 12 days per year.
[f] Includes sample preparation charge from Table 2.

Table 2. Approximate Laboratory Analysis Costs by Constituent Group

Constituent	Cost in Dollars/ Sample	
Group 1		
Total dissolved solids	20	
Total suspended solids	20	
Volatile suspended solids	40	
Settleable solids	20	
Nitrate	45	
Total phosphate	30	
Ammonia	20	
Hardness	25	
pH [a]	field	
Dissolved oxygen [a]	field	
Specific conductance [a]	field	
Fecal coliform	30	
Turbidity	20	
Temperature [a]	field	
Total cost/group 1 sample	270	
Group 2		
Metals (boron, selenium) [b]	40	
Total cost/group 2 sample	40	
Group 3		
Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc) [c]	190 [d]	
Total cost/group 3 sample	190	
Group 4		
Pesticides [e]		
Organochlorines and PCBs	175 [d]	EPA method 617 [f]
Organphosphates	250	EPA method 622
Carbamates	225	EPA method 632
Hexachlorobenzene	175	EPA method 612
Total cost/group 4 sample	825	

Table 2. Continued

Constituent	Cost in Dollars/ Sample
Group 5	
Chronic toxicity testing (3 species)	2,600
Total cost/group 5 sample	2,600

[a] Measurement taken in field by Jones & Stokes Associates staff; cost is $40 for all four constituents.

[b] Analyses by graphite furnace AA.

[c] All analyses by graphite furnace AA, except mercury which is by cold vapor.

[d] Add sample preparation charge of $20/sample for sediment and biological analyses.

[e] Selection of pesticide scans is preliminary and subject to modification during initial Phase I coordination and refinement.

[f] EPA method varies for solids.

The analyses and costs presented in Tables 1 and 2 are based on current laboratory rates at a typical southern California laboratory surveyed for this proposal. These rates were compared for cost effectiveness with a Sacramento laboratory with which we have substantial experience. Costs and other conditions may change, depending on the final laboratory selection.

Select and Subcontract Laboratory

It is likely that more than one laboratory will be required to adequately perform the wide variety of testing requested by RWQCB. Analytical laboratories will be identified and selected as one of the first tasks of Phase I water quality monitoring program. Subcontracts made with each selected laboratory will identify parameters, methods, maximum costs, quality assurance/quality control requirements, and reporting requirements to ensure that quality results are obtained. Selected laboratories may include those already used by IID, including southern California coastal labs or their affiliates, or laboratories currently used by Jones & Stokes in northern California.

Conduct Water Quality Monitoring

This task involves the allocation of field staff, laboratory coordination and scheduling, travel time, and other activities to support field sample collection and delivery to the selected analytical laboratories during the first year of monitoring. This proposal assumes that Jones & Stokes Associates staff will perform this task. IID may, at its option, elect to perform this task, according to discussions with Steve Knell.

Estimated labor and equipment costs and direct expenses were presented in Table 3. The total for labor and expenses to conduct water quality monitoring is $50,572. Table 3 shows total costs with and without Jones & Stokes Associates staff labor.

Prepare Toxicity Testing Report

A report will prepared at the end of the first year of the chronic toxicity testing. The report will contain the information requested in the RWQCB letter, including a summary of sampling activities and laboratory results, discussion of any problems encountered, and an analysis of species sensitivity. Species sensitivity is important because once the most sensitive species are identified, two species instead of three may be used for testing, thereby reducing laboratory costs. This task will also include data evaluation to determine whether a Toxicity Identification Evaluation is required. This task does not include conducting a Toxicity Identification Evaluation, which would be priced separately if needed at a later date.

Water Quality Data Evaluation

We will evaluate the data collected in Phase I monitoring. We will also evaluate the levels of metals, chemicals, pesticides, or other constituents that are toxic to, or could produce detrimental effects on, humans or aquatic life. This task does not include entry into a computer database.

This task also includes assessment of laboratory data, according to the RWQCB letter, and evaluation of acute toxicity requirements. As discussed on page 2 of the RWQCB letter, there should be no acute toxicity in agricultural drain waters discharged to receiving waters.

Data Collection and Database Development. At IID's option, Jones & Stokes Associates will compile existing data specifically for agricultural drainage from available sources (e.g., RWQCB, USGS, IID), compile the data, and develop an interactive computer database. We will enter new data from the monitoring program as the data are generated and incorporate it into the database.

The database would be used to compare agricultural data with data for stormwater runoff and other nonagricultural drainage sources in the drains and be incorporated with the database currently being conducted for the preliminary drainage master plan. This task was not included in the RWQCB letter, but RWQCB has expressed the need for a determination of the relative contribution of mass pollutant loading by the different sources in the IID drains. This database would facilitate analysis of mass loading contributions from these different pollutant sources and address RWQCB concerns.

Recommend Phase II Program

The final task of Phase I is to recommend the scope of work, recommended analyses, and estimated budget for the Phase II program. The purpose of Phase II is to finalize the draft DWQIP based on the water quality data collected during Phase I and the results of the Phase II BMP testing. Changes to the recommended BMPs and the sampling program will be made based on the data.

In Phase II, the BMPs will be evaluated relative to the monitoring data to assess the viability of the conceptual BMPs and suggest changes in the BMP program. This analysis will include establishing the pilot testing of BMPs to be conducted in Phase II. We will identify the BMPs and their location, the scale, and estimated costs of the testing program.

Developing the Phase II program will entail evaluating the water quality monitoring data to refine the monitoring program. The data may demonstrate the need to sample different constituents or different locations or to change the sampling frequency.

Recommending the Phase II program will entail summarizing the cost for Phase I data collection and projecting the Phase II costs.

At the end of Phase I, we will conduct focused surveys to assess the success of the public outreach program. The surveys will assess the public's understanding of the DWQIP, the need for water quality control, and the role of BMPs. The results of this survey will be to refine and focus the public outreach program in Phase II.

Develop the Draft Drain Water Quality Improvement Program

The monitoring program and BMP program constitute most of the DWQIP. We will develop a written program that summarizes the monitoring and the BMP list. The program will also describe Phases II and III.

The draft DWQIP will include the final recommendations for the BMP program, including type, location, and estimated cost. The DWQIP will provide the transition between the list of conceptual BMPs and the pilot testing.

The final public outreach program will be included in the DWQIP. The Phase II outreach will focus on farmer participation in BMPs and therefore will emphasize educational programs describing incorporation of BMPs into land use practices.

The draft DWQIP will summarize the Phase I data for review by IID. We intend for IID to review the draft DWQIP and provide comments. Jones & Stokes Associates will incorporate the comments into the Phase II planning and in the final DWQIP. The final DWQIP will be produced in Phase II.

The cost estimate for this task is $15,396. The total cost for Phase I, including expenses, is $207,196, not including the labor and expenses for water quality sampling. The total cost, including Jones & Stokes Associates' collecting the water quality data, is $257,768. The summary of costs is presented in Table 3, and a detail of personnel costs is presented in Table 4.

PHASE II

The Phase II scope will be developed at the end of Phase I using the results of the monitoring and the BMP programs. This scope is dynamic because it will change throughout Phase I as more data become available. Although the scope of Phase II will not be known until review of the data and completion of Phase I, the anticipated elements are described below.

Table 3. Phase I Cost Estimate Summary

Phase I Task	Technical Labor	Support Labor	Total Labor	Total Expenses	Total Cost
Coordination	$7,476	$0	$7,476		
BMP Program	$13,100	$0	$13,100		
Public Outreach	$12,360	$1,584	$13,944		
Recommend Phase II Program	$8,440	$0	$8,440		
Develop DWQIP	$9,816	$5,580	$15,396		
Expenses					
Travel				$3,000	
Laboratory analysis				$133,000	
Report reproduction				$500	
Computer				$1,200	
Miscellaneous				$500	
JSA administrative fee				$10,640	
Total Labor			$58,356		
Total Expenses				$148,840	
Total Without WQ Monitoring Labor					$207,196
Water Quality Monitoring	$34,520	$2,232	$36,752		
Expenses					
Travel				$12,000	
Equipment rental				$1,500	
Report reproduction				$200	
JSA administrative fee				$120	
Total Labor			$36,752		
Total Expenses				$13,820	
Total Additional for WQ monitoring					$50,572
Subtotal for all tasks			$95,108	$162,660	
Total Phase I Cost					$257,768

Table 4. Phase I Cost Estimate for Drain Water Quality Improvement Program

Task	Technical Staff Hours								Subtotal	Production Staff Hours			Subtotal	Labor Total	Direct Expense Subtotal	Total Cost
	Iferson	Wisbcropp	Zaanli	Brewer	Cotter	Page	Field	ES I		Word Processing Operator	Editor	Delineator				
Phase I																
Coordination	4	60	24						$7,476					$7,476		
BMP Program		20	64	40		64			$13,100					$13,100		
Public Outreach	4	24			80			60	$12,360	24	16		$1,524	$13,944		
Recommend Phase II Program		40	40				40		$8,440					$8,440		
Develop DWQIP	8	40	40	32					$9,816	80	40	20	$5,580	$15,396		
Subtotal for Phase I																$58,356
Water Quality Monitoring		24	84	8		272	224		$34,520	32	16	8	$2,232	$36,752		$36,752
Total hours	16	208	252	80	80	336	264	60		136	72	28				
Billing rate (1994)	$108	$87	$76	$76	$87	$54	$48	$48		$38	$42	$43				
Subtotals	$1,728	$18,096	$19,152	$6,080	$6,960	$18,144	$12,672	$2,880	$85,712	$5,168	$3,024	$1,284	$9,396	$95,108		
Direct expenses																
BMP Program																
Travel															$3,000	
Laboratory analyses															$133,000	
Report reproduction															$500	
Computer															$1,200	
Miscellaneous															$500	
JSA administrative fee															$10,640	
Subtotal																$148,840
Water Quality Monitoring																
Travel															$12,000	
Equipment rental															$1,500	
Report reproduction															$200	
JSA administrative fee															$120	
Subtotal																$13,820
Total Labor																$95,108
Total Expenses																$162,660
Grand Total																$257,768

BMP Program

The final task of Phase I is to revise the list of BMPs based on the monitoring data and other available information, and suggest BMPs for testing. The purpose of the Phase II BMP program is to begin pilot testing of suggested BMPs. Pilot testing will help demonstrate workable BMPs and suggest final design and size of facilities.

We will work with IID and any private landowners to establish the pilot testing. This includes determining the responsible party for operation and maintenance, monitoring, and duration of the test. We anticipate that the Phase II BMP program will comprise the following tasks:

- setting a budget for all BMP testing,
- establishing the chain-of-command for operation of the tests,
- identifying goals and objectives for each test, and
- identifying criteria to measure success of each BMP.

Water Quality Monitoring

Phase II monitoring is a refinement of the previous monitoring. The data collected in Phase I may indicate the need to change the sampling frequency, constituents sampled, or accuracy of the sampling. Any changes will be recommended at the end of Phase I and the changes will occur in Phase II. Changing the monitoring program will increase the efficiency of sampling and provide results useful to the DWQIP while minimizing the cost of monitoring.

We will modify the monitoring program based on the recommendations in Phase I and initiate the second year of monitoring. Potential changes in the Phase II monitoring include:

- the location or frequency of sampling,
- the constituents sampled, and
- the accuracy of the measurement.

Public Outreach

The Phase II public outreach program is intended for those individuals who are undertaking pilot testing of BMPs and also continue the public information effort. As with other Phase II programs, the scope of the public outreach program may change after

evaluation of the Phase I program. For example, Phase I may demonstrate a need to increase the dissemination of information about the need for a DWQIP.

The major components of the Phase II public outreach program will include:

- direct contact with individuals conducting pilot testing;
- presenting a summary of Phase I and a status of the DWQIP;
- continued presentation of the need for BMPs, with emphasis on the BMPs being tested; and
- dissemination of information regarding the jurisdictional requirements underlying the DWQIP.

Prepare Final DWQIP

The final DWQIP will combine the draft DWQIP and all comments on the document, the results of the monitoring conducted during Phases I and II, and the results of the pilot testing of BMPs. The DWQIP will contain the following elements:

- an assessment of the baseline water quality in the drains within the IID service area, including sources of water quality problems;
- a summary of the BMP testing program, including final recommendations for BMPs to implement;
- goals and objectives for water quality improvement within the IID drains;
- procedures and policies to implement to improve the water quality in the drains; and
- responsible party for maintaining water quality and implementing BMPs.

PHASE III

Phase III will be conducted by IID personnel. It involves the long-term monitoring and implementation of prototype BMPs. The Phase II tasks are defined by the final DWQIP. We assume that updating of the DWQIP will occur in Phase III, but the extent and timing of any changes are unknown.

We are identifying Phase III in this scope of work to complete the description of the DWQIP development process. We anticipate only an advisory role in Phase III; IID will conduct the Phase III tasks, as defined in the final DWQIP.

BMP Program

The BMP program will involve using the successful BMPs and applying them throughout the IID service as needed. This transition from testing to prototype will follow the recommendations of the final DWQIP, developed in Phase II.

A major part of the Phase III effort will be the public outreach program to encourage farmers to implement appropriate technology to control water quality. Successful BMPs will be expanded as needed to control water quality problems that are identified during the long-term monitoring. The process of evaluating and expanding BMPs will occur throughout Phase III and will be managed by IID.

Water Quality Monitoring

The Phase III water quality monitoring is the long-term monitoring of the drains. IID will conduct the monitoring program and report the results to the RWQCB.

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Wilson/clc/339-9263

IIDWD

January 13, 1986

Mr. Milton Costello
District Maintenance Engineer
State of California
District 11
P.O. Box 85406
San Diego, CA 92138-5406

Dear Mr. Costello:

The runoff from rain flowing in the west borrow pit of Highway 86, north from El Centro, is discharged into the Central Drain by a 12-inch diameter pipe. The accumulated rainwater recently overflowed the borrow pit and inundated a portion of the adjacent property.

The problem has a long history and could accelerate as El Centro develops. Caltrans should limit additional inflow into the state borrow pit, which is now overloaded.

A partial solution for the present problem would be to install an additional 12-inch diameter borrow pit pipe into the Central Drain parallel to the existing pipe, and do other bank modifications to prevent water flowing onto adjacent property.

The new installation would be Caltran facilities installed by Imperial Irrigation District, with total cost by Caltrans.

Cost Estimate:

20 jts. - 12" x 6' RCP @ $59.45/jt.	$1 189 20
1 jt. - 18" x 7.5' RCP	100 13
1 - 20" x 20" x 5' concrete well box with lid	137 25
2 sacks - cement @ $5.80/sack	11 60
Installation (including Supervision & General Expense)	2 061 82
Total estimated cost	$3 500 00

If you desire to proceed with the project, please contact us.

Yours ~~very~~ truly,

J.R. Wilson

J.R. WILSON, Manager
Water Department

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656.021

IMPERIAL IRRIGATION DISTRICT

WD

MEMORANDUM

TO General Manager

DATE February 10, 2000

FROM Manager

COPIES Mike
Carlos
Mario
Elston
Steve
Rod
Jim

DEPT Water

SUBJ Drainage Water Pumping Program

As I understand, in 1995 the Water Department, in response to a rising Salton Sea (resulting from unseasonable rains, cool temperatures, high humidity and a resultant low evaporation rate) began a drainage water pumping program. There was a need at the time that by "doing something" of this sort would show the community the IID was being proactive in stemming the rising Salton Sea.

The program was offered to willing participants and involved the IID paying for infrastructure improvements to spread drainage water over lands that were, had been, or were desired for, the purpose of attracting waterfowl. Generally, duck clubs were the sole source respondents to the IID's needs at the time. The general improvements made to these duck clubs were the installation of sumps, pumps and associated electrical improvements. Agreements with participants (most were signed agreements) were on a seasonal use basis and/or a 30-day written termination clause.

I believe our continued involvement in this old program is impacting our budget and our efficiency to get our own work done. Our Maintenance Section still receives periodic calls for pump maintenance or servicing, ditch cleaning, levee maintenance and other activities from these old duck clubs. In addition, the Water Department is still paying for the power usage on all installed pumps under this program. All these activities appear to be an inappropriate expenditure of IID funds at the present time and actually do very little to stem the rising Sea.

With your concurrence, I would like to proceed with the termination of all these old agreements along with a cessation of all the IID activities related to this program. I would like to offer to any willing duck club the clear title to all infrastructure improvements the IID made (i.e., pumps, sumps and the like) that were made to their lands while they were involved in the IID program. In addition, all future operating costs, specifically power costs, would be borne by the landowner. The IID will likewise offer the removal, at no cost, of any facilities it installed under this program, should the landowner wish so.

Please let me know if you agree or provide me with your preferred direction in this area. Thank you.

JOHN R. ECKHARDT

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IMPERIAL IRRIGATION DISTRICT

WD MEMORANDUM

TO Lynda Trimm
Publications Specialist

DATE February 10, 2000

FROM Manager

COPIES

DEPT Water

SUBJ ***Fact Sheet: Drainage Water Pumping/Waterfowl Habitat Program***

Due to impacts in the involvement of this program, the Water Department may drop the subject program. Therefore, please discontinue reproducing the attached *Fact Sheet*. Thank you.

JOHN R. ECKHARDT

Attachment
/lh
U:Mem/FactSheet_Drainage.doc

John –

I wrote this ~~two~~ 3 years ago. Much of it is unchanged & still accurate. I was going to return without changes unless you see otherwise.

Knell

Send memo to Jesse

Do away with program

pumping water [illegible]

To: Steve Knell
Please revise as needed & return.
TYS! -Lynda Trimm

IMPERIAL IRRIGATION DISTRICT

FACT SHEET: Drainage Water Pumping/ Waterfowl Habitat Program

On July 4, 1995, Imperial Irrigation District (IID) personnel turned the switch to begin pumping agricultural drainage water onto a 120-acre duck club. The event marked the initiation of a series of 14 similar projects that today provide nearly 1,425 acres of year-round wetland habitat in the Imperial Valley.

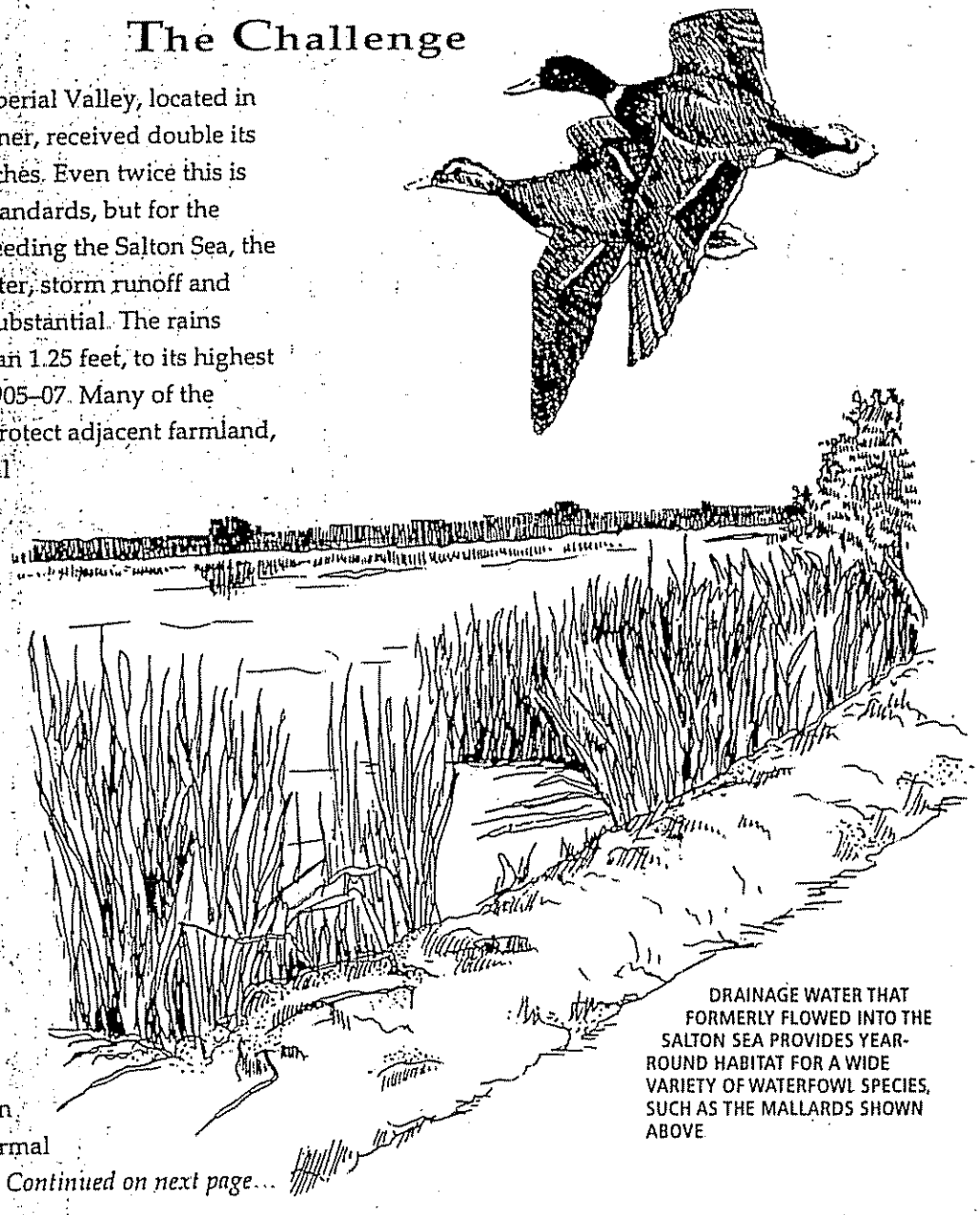
In addition to furnishing much-needed habitat for California waterfowl on the Pacific Flyway, IID is learning that this program benefits not only our own constituents, by finding a use for this byproduct of irrigated agriculture, but also offers other districts searching for drainage solutions a new option.

The Challenge

During the winter of 1993, the Imperial Valley, located in California's southeasternmost corner, received double its "normal" annual rainfall of 2.8 inches. Even twice this is not much rain by most people's standards, but for the 8,000 square miles of watershed feeding the Salton Sea, the repository for Valley drainage water, storm runoff and wastewater from Mexico, it was substantial. The rains raised the Sea's elevation more than 1.25 feet, to its highest level since the historic floods of 1905–07. Many of the dikes that surround the Sea and protect adjacent farmland, geothermal plants and recreational properties were jeopardized, because the dikes were not engineered to withstand so much water.

That winter and over the next two years, IID embarked upon a major construction program to reinforce the dikes to make them safe again. But when this work was completed, IID faced yet another challenge. The Salton Sea remained at an all-time high and was not going down. The dilemma was to find someplace else to put the drainage water that continued to flow off of the Valley's half-million acres of farmland as a result of normal farming practices.

Continued on next page...



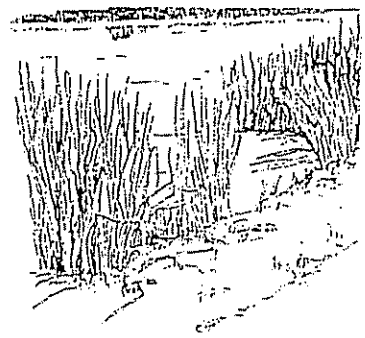
DRAINAGE WATER THAT FORMERLY FLOWED INTO THE SALTON SEA PROVIDES YEAR-ROUND HABITAT FOR A WIDE VARIETY OF WATERFOWL SPECIES, SUCH AS THE MALLARDS SHOWN ABOVE

External Affairs Department • P.O. Box 937 • 333 E. Barioni Blvd • Imperial, CA 92251-0937 • (760) 339-9426 • Fax (760) 339-9191

A Solution

Opportunity presented itself in the roughly 8,000 acres of land managed as private duck clubs in the Imperial Valley. Typically, water is put in club ponds beginning in September or October to attract migrating waterfowl. The clubs are then very active during the hunting season, which runs from November through January. After January, the ponds are usually drained and remain idle until the following October.

Why not use the idled lands as ponds to store drainage water before it reaches the Salton Sea? IID's thinking was that spreading this water onto duck clubs—increasing the surface area and maximizing evaporation before returning the water to the drain—could help reduce the volume reaching the Salton Sea. After all, with an annual evaporation rate of over six feet per year, any increase in water surface area could only be beneficial.



The Drainage Water Paradox

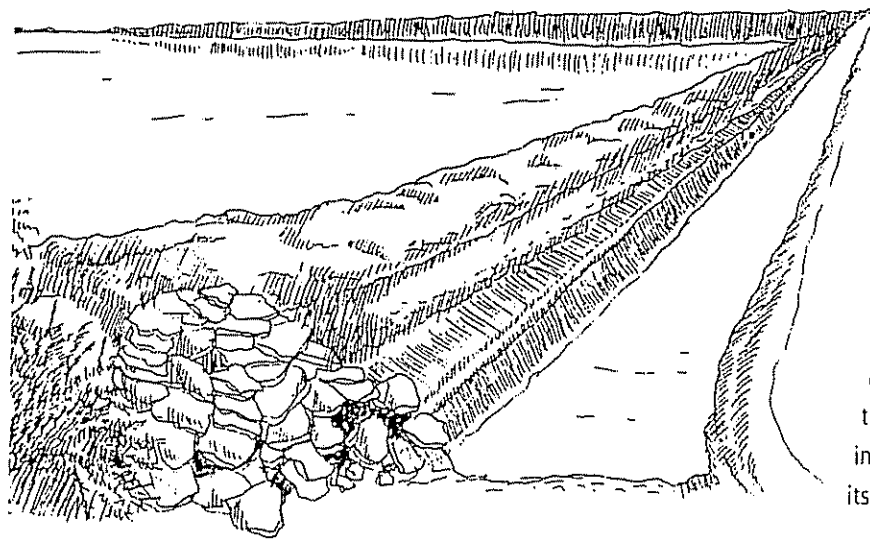
Imperial Irrigation District's drainage water pumping program is at odds with views currently held by the California Department of Fish and Game (DFG) and the United States Fish and Wildlife Service (USFWS).

Over the past three years, IID has repeatedly asked for assistance from these agencies in exploring the benefits of using its drainage water for wildlife enhancement, but no substantive movement from either agency has taken place. Their reason: selenium and the experience of Kesterson Wildlife Refuge in the San Joaquin Valley.

For newcomers to this water-quality issue, selenium is a naturally occurring metal which, in high concentrations, can lead to deformities in bird hatchlings. Any and all selenium found in the Imperial Valley is imported via Colorado River water, the Valley's sole source for irrigation, municipal and industrial use. As a basis of comparison, the federal standard, or concentration allowable, by the United States Environmental Protection Agency is a criteria continuous concentration (CCC) of 5 parts per billion (ppb) for wildlife. Inflow measured at Kesterson contained 440 ppb of selenium, while Imperial Valley drainage water has a median concentration of just 6 ppb. Although this slightly exceeds the federal standard, no deleterious effects related to selenium have ever been observed by any wildlife agency in the Imperial Valley. IID believes the benefits of ponding Valley drainage water far exceed any vanishingly small risk.

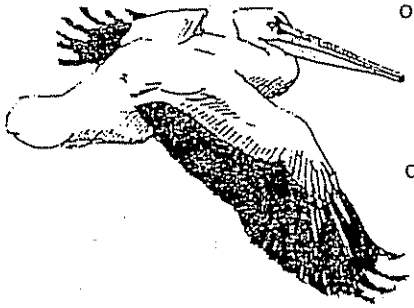
The paradox is that for decades, DFG received drainage water on most of its 5,800 acres of habitat management areas—totally without incident. State orders to stop accepting agricultural drainage water created quite a predicament for DFG's Imperial Valley operations, because all the drainage water it received from IID was free. (IID policy allows for the use of drainage water without charge to the using party.)

Since DFG could no longer use the free drainage water, it was forced to purchase irrigation water, for which it had no budget. As a result, DFG has had to dry up nearly 5,000 acres of its wetland management areas in the Imperial Valley, in order to live within its meager budget



Enthusiastic Response

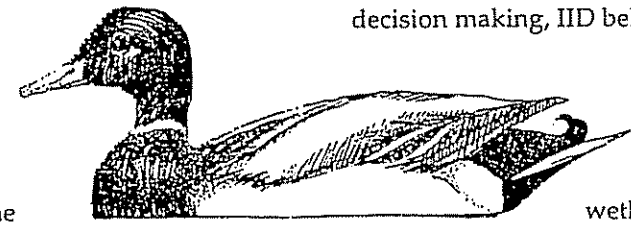
In April 1995, IID began contacting duck club owners and presented them with our proposed solution. To our surprise, interest was overwhelming. In fact, requests for drainage water exceeded the allotted budget for the program, forcing IID to be selective in the sites chosen.



Another surprise was the diversity of participants. Farmers were more than willing to participate, as was expected, but geothermal companies and other landowners also wanted to enroll in the wetland habitat program as well.

A Learning Experience...and Unanswered Questions

Since this program's inception, IID has monitored for water-quality changes in the ponds and has made some interesting findings. Most of the drainage water flowing off the duck ponds is of better quality than that flowing on, with selenium concentrations 40 percent or more lower. Obviously, the selenium is settling out, but how soon after it reaches the pond? Monitoring the pond sediment has failed to measure unsafe concentrations—so where is the selenium going? These questions, and others, have led to a study IID has undertaken with the U.S. Bureau of Reclamation to answer many of the concerns related to the reclamation and reuse of drainage water in the Imperial Valley.

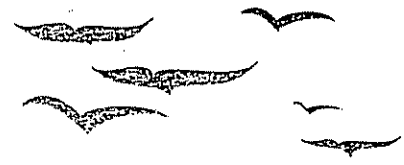


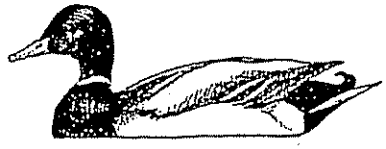
No one wants to see another Kesterson, especially in agriculture-rich Imperial Valley, a region blessed with a year-round growing season and where annual crop values total nearly $1 billion. But fear should not cloud good judgment and common sense in finding solutions to environmental issues. Careful monitoring and sound decision making, IID believes, will arrive at answers to most of the questions and concerns raised about the long-term effects of using agricultural drainage water in wetland situations.

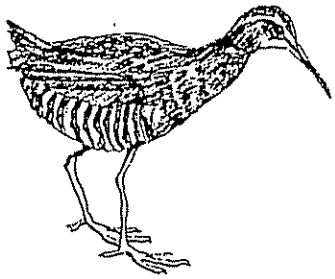
Program Successes

Thus far, IID estimates the drainage water pumping/waterfowl habitat program reduces inflows to the Salton Sea by about 8,400 acre-feet annually. This is a relatively minor reduction, but when combined with IID's other water conservation measures it represents an incremental benefit. Far beyond this small gain, the monitoring program, which pointed up the improvement in quality between drainage water inflow and outflow, has spurred still other avenues of investigation. These alone may uncover new opportunities for the reclamation and reuse of agricultural drainage water not considered previously.

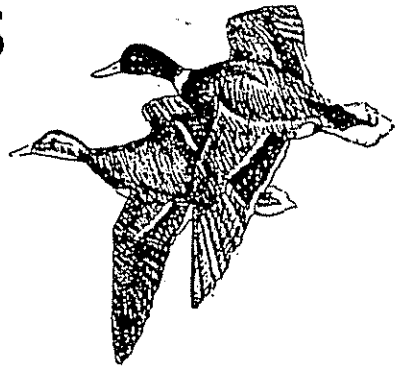
Other program successes are not as tangible but are just as important. Of course, the expanded wetlands and wildlife utilization of this habitat are difficult to express in only monetary terms. From a public policy perspective, the program also enhances IID's ongoing efforts to build partnerships between our constituents and the environmental community. These relationships demonstrate a growing recognition of agriculture's role in providing wildlife habitat.



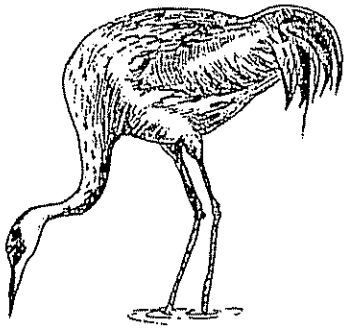




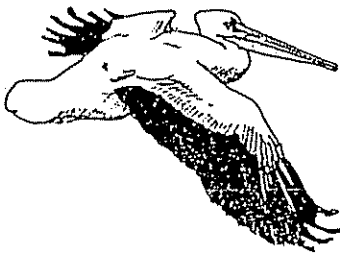
VARIED BIRD SPECIES



A wide variety of birds call the Imperial Valley home for at least a portion of the year. Look closely and you may spot the following:



- Clark's Grebe
- Cinnamon Teal
- Common Moorhen
- Redhead (Duck)
- Ruddy Duck
- Great Egret
- American Coot
- Common Teal
- Mallard (Duck)
- Black Crowned Night Heron
- Green Heron
- Great Blue Heron
- Least Bittern Rail
- American White Pelican
- Brown Pelican
- Willet
- Caspian Tern
- Western Sandpiper
- Pie-billed Grebe
- Double-crested Cormorant



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IMPERIAL IRRIGATION DISTRICT

OPERATING HEADQUARTERS • P. O. BOX 937 • IMPERIAL, CALIFORNIA 92251

August 30, 1999

Mr. Philip Gruenberg, Executive Officer
California Regional Water Quality Control Board
Colorado River Basin Region
73-720 Fred Waring Drive, Suite 100
Palm Desert, CA 92260

Subject: Application of Methanol in the IID's Lewis Drain Treatment Facility

Dear Mr. Gruenberg:

In an effort to improve drain water quality in the Imperial Irrigation District's (IID's) drainage system for potential reuse, the IID in partnership with the U.S. Bureau of Reclamation constructed the Lewis Drain Treatment Facility. The concept behind the project is to separate tilewater (subsurface) from tailwater (surface) and treat them with different techniques. Tailwater is collected and exposed to sunlight in a widened drain where the water level is controlled by concrete drop structures. Tilewater is diverted to an underground gravel treatment channel 1200 ft. long, 28 ft. wide, and 5 ft. deep. The gravel treatment channel is the point of interest for this report.

The gravel channel is intended to optimize bacterial reduction of nitrate and selenate by using anaerobic bacteria. It was expected that there would be sufficient usable carbon in the water to serve as a food source for the bacteria. Unfortunately, analyses of water samples at the site revealed no BOD in either the tile or tailwater. This indicates that the water does not have the necessary usable carbon to sustain the bacteria desired.

Water treatment facilities including the U.S. Filter demonstration project on the Alamo River have been successfully using methanol (CH3OH) as a source of carbon to sustain selenium-eating bacteria. It is believed that adding CH3OH to the water flowing into the gravel channel would be an appropriate course of action to take in order to assist the project's performance. We are sending this letter to inform you of our intended course of action for this project which will include the application of CH3OH in the following amounts:

Required ratio of carbon (C) to nitrate as nitrogen (N) =	5:1
Concentration of N in Lewis Drain =	5 mg/L
Required C concentration =	25 mg/L
% of C in CH3OH =	37 %
Required concentration of CH3OH =	68 mg/L H2O

Specific Gravity of CH3OH = 68(mg/L H2O) x 1/0.79(mL/g) x 0.001(g/mg) =	0.79 g/mL 0.086 mL/L H2O or 86 ppm CH3OH
325,851(gal/AF) x 0.000086 =	28 gal CH3OH /AF H2O
Project Pump flow rate (calibrated 5/17/99) =	1.26 cfs or 564 gpm
Required injection rate: 564(gpm) x 0.000086 x 3.7854(L/gal) x 1,000(mL/L) =	184 mL/min
Design flow rate = 0.25cfs (design flow) / 1.26cfs (pump flow) = Assume pump operates 20% of the time.	0.25 cfs 0.20
Annual volume of CH3OH needed: 564(gpm)H2O x 0.20 x 86(gal)CH3OH/1,000,000(gal)H2O x 60(min/hr) x 24(hr/day) x 365(day/yr) =	5100 gal/yr

If you have any questions or comments, please contact Steve Charlton at (760) 339-9143.

Sincerely,

Elston K. Grubaugh

ELSTON K. GRUBAUGH
General Superintendent, Resources Management

SLC
Lewis Drain_RWQCB.doc